DOCUMENT RESUME

ED 224 688 SE 039 717

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TITLE A Study of the Relationship of Student Test Scores on Math and Science Subjects with Their Scores in Other Subjects in a Sub-Urban School of Jeddah, Saudi Arabia. Occasional Research Study.
INSTITUTION Umm Al-Qura Univ., Mecca (Saudi Arabia).
PUB DATE 82
NOTE 20p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; *Correlation; Educational Research; *Grade 10; *Scores; Secondary Education; *Secondary School Mathematics; *Secondary School Science
IDENTIFIERS *Mathematics Education Research; Saudi Arabia

ABSTRACT

It is noted that research concerning correlates of academic achievement has mainly concentrated on such variables as education and occupation of parents, student personality variables, school-related variables, and racial background of students. However, this study focused on the relationship between student achievement in a given subject with another subject. Data for the study were gathered from the mid-year examinations of six sections of tenth-grade students from a Jeddah suburban school. Student records for 17 subjects were obtained. Several tables are presented showing the correlations of mathematics and science grades with other subjects. Correlations were obtained through use of the Pearson Product-Moment formula. Results showed a generally higher degree of correlation among mathematics and science courses than between these courses and other subjects. The findings lend support to the contention that strengthening mathematics and science programs in schools, in combination with the development of good study habits among students, can help develop those intellectual abilities which are instrumental in learning other subjects. (MP)

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ED224688

A STUDY OF THE RELATIONSHIP OF STUDENT TEST SCORES ON MATH. AND SCIENCE SUBJECTS WITH THEIR SCORES IN OTHER SUBJECTS IN A SUB-URBAN SCHOOL OF JEDDAH, SAUDI ARABIA.

By:

Dr. Abdullah Mohammad Khouj.

OCCASSIONAL RESEARCH STUDY

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A STUDY OF THE RELATIONSHIP OF STUDENT TEST SCORES ON MATH. AND SCIENCE SUBJECTS WITH THEIR SCORES IN OTHER SUBJECTS IN A SUB-URBAN SCHOOL OF JEDDAH, SAUDI ARABIA.

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Research concerning correlates of academic achievement has mainly concentrated on such variables as education and occupation of parents, student personality variables, school related variables and racial background of students. However, some studies have also attempted to examine relationship between student achievement in a given subject with another subject. The chief objective of the latter type of studies has been to present a case that academic achievement in a given subject affects student achievement in other subjects as well. For example, with the discovery of a positive relationship between reading and social studies scores, it has been hypothesized that reading affects achievement in social studies. In fact, reading is generally considered a key to academic performance in other subjects and empirical evidence linking reading achievement with achievement in other subjects has been presented with a view to pleading for strengthening of reading programs.

While the effect of reading ability on the achievement in other subjects can be logically understood, and the empirical evidence further strengthens this conviction, the effect of students' abilities in some other subjects upon their achievement in another subject can also be hypothesized. As an instance, if there is an overlap between content and concepts of any two subjects, then academic achievement in one of these subjects could, and generally does, affect academic achievement in the second subject. Here we take up the case of Mathematics and Physics. As the studies in these subjects get advanced, the content-and-concept-overlap between these subjects increases and it is generally accepted that academic achievement in one affects the other. In addition to overlap of content, certain subjects might take upon and also nourish such general intellectual abilities which are instrumental in inculcating academic achievement in other

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subjects. Therefore, if, one finds that a student's performance in a given subject is positively correlated with student performance in most other subjects (while other major correlates of student achievement are controlled for) one can hypothesize that the subject under study takes upon and nourishes such intellectual abilities which are needed for performance in other subjects.

Following this line of thought, an exploratory study was conducted to examine the interrelationship of student performance in various subjects. This paper is limited to the study of interrelationship between Math. and science subjects (Physics, Chemistry and Biology) with other subjects.

The data for the study were gathered from the mid-year examinations of the six sections of tenth grade students from a Jeddah suburban school. The number of students for each section was as follows: A-29; B-29; C-31; D-27; E-26; F-33. Most of the students were Saudies. In case of a large number of students, parents had no formal schooling, family provided no help in studies, and parents had no formal occupation.

Student records for the following seventeen subjects were obtained: Quran (Study of the Holy Book), Hadith (Traditions of Holy Prophet Mohammad, Peace be upon him), Tauhid (Studies of Oneness of God), Fiqh (Islamic Jurisprudence), Geometry, Algebra, Physics, Chemistry, Biology, Grammar, Balagha (Rhetoric), Reading, English, Arabic Literature, Writing, History, Geography. The interrelationships between various subjects were calculated by the Pearson product - moment formula.

It may be pointed out that at this time in Saudi Arabia standardized testing programs do not exist. Therefore in order to avoid the variability in teachers' grading, individual students from various schools of Jeddah were not picked for the study. Rather, all students studying under one teacher were considered. For every section, each subject was correlated with other subjects sixteen times. Thus, in all, each subject was correlated 96 times with other subjects.

The correlations between Physics, Biology, Chemistry, Algebra, Geometry and other subjects are given in Table I.

TABLE I.

Correlations of Math. and Science Subjects With Other Subjects.

	PHYSICS	BIOLOGY	CHEMISTRY	ALGEBRA	GEOMETRY	QURAN	HADITH	TAUHID	READING	ENGLISH	HISTORY	GEOGRAPHY	GRAMMAR	LITERATURE	BALAGHA	WRITING	FIQH
Physics Section A		.6202 **	.5957 **	.5472 **	.5443 **	.2345 N.S	.2771 N.S	.2786 N.S	.4963 **	.6434 **	.4982 **	.3659 N.S	.5826 **	.6229 **	.6046 **	.4379 *	.1077 N.S
Physics Section B		.5600 **	.5700 **	.5002 **	.4864 **	.1712 N.S	.0548 N.S	.6257 **	.5718 **	.4387 *	.3704 *	.4966 **	.3263 N.S	.5057 **	.5581 **	.3870 *	.1245 N.S
Physics Section C		.6732 **	.6189 **	.6420 **	.6491 **	.0574 N.S	.2771 N.S	.1253 N.S	.5348 **	.5816 **	.6237 **	.4748 **	.4637 **	.5487 **	.3471 N.S	.5949 **	.1149 N.S
Physics Section D		.6580 **	.5916 **	.5400 **	.6904 **	.4687 *	.3084 N.S	.4027 *	.4656 *	.6182 **	.4399 *	.5977 **	.5416 **	.5409 **	.5376 **	.5366 **	.5082 **
Physics Section E		.6801 **	.7011 **	.4790 *	.3154 N.S	.3587 N.S	.2644 N.S	.5850 **	.1487 N.S	.4112 *	.3567 N.S	.3137 N.S	.6296 **	.2449 N.S	.6075 **	.4500 *	.3415 N.S
Physics Section F		.4724 **	.3841 *	.4219 *	.3274 N.S	.2069 N.S	.2544 N.S	.5039 **	.1265 N.S	.4527 **	.4809 **	.7340 **	.2508 N.S	.5792 **	.5962 **	.4696 **	.2193 N.S

TABLE I.

Correlations of Math. and Science Subjects With Other Subjects.

	PHYSICS	BIOLOGY	CHEMISTRY	ALGEBRA	GEOMETRY	QURAN	HADITH	TAUHID	READING	ENGLISH	HISTORY	GEOGRAPHY	GRAMMAR	LITERATURE	BALAGHA	WRITING	FIQH
Biology Section A			.7295 **	.8461 **	.4462 *	.2057 N.S	.0000 N.S	.1217 N.S	.4407 *	.6471 **	.7144 **	.4779 **	.5656 **	.6238 **	.7307 **	.3767 *	.2287 N.S
Biology Section B			.6961 **	.4948 **	.6096 **	.2694 N.S	.1637 N.S	.5012 **	.6061 **	.5923 **	.5197 **	.6235 **	.3146 N.S	.4406 *	.4410 *	.4920 **	.2083 N.S
Biology Section C			.6509 **	.6890 **	.5547 **	.0943 N.S	.3473 N.S	.3209 N.S	.5079 **	.5379 **	.6391 **	.7100 **	.5602 **	.5356 **	.5783 **	.5675 **	.0849 N.S
Biology Section D			.7446 **	.6534 **	.6246 **	.5032 **	.0632 N.S	.3837 *	.7110 **	.7038 **	.5524 **	.7406 **	.4960 **	.7141 **	.6491 **	.7374 **	.5466 **
Biology Section E			.3289 N.S	.0000 N.S	.4962 *	.2326 N.S	.3652 N.S	.4266 *	.1868 N.S	.1646 N.S	.7885 **	.4177 *	.5913 *	.2648 N.S	.2191 N.S	.5967 **	.2796 N.S
Biology Section F			.6263 **	.5676 **	.7645 **	.1533 N.S	.1536 N.S	.3038 N.S	.2903 N.S	.6116 **	.3242 N.S	.5698 **	.5027 **	.3311 N.S	.2488 N.S	.2245 N.S	.4908 **

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TABLE I.

Correlations of Math and Science Subjects With Other Subjects.

	PHYSICS	BIOLOGY	CHEMISTRY	ALGEBRA	GEOMETRY	QURAN	HADITH	TAUHID	READING	ENGLISH	HISTORY	GEOGRAPHY	GRAMMAR	LITERATURE	BALAGHA	WRITING	FIQH
Chemistry Section A				.7548 **	.4904 **	.3909 *	.1631 N.S	.2267 N.S	.5158 **	.6434 **	.6639 **	.4427 *	.6061 **	.4958 **	.7595 **	.5069 **	.2182 N.S
Chemistry Section B				.5898 **	.6668 **	.3148 N.S	.1916 N.S	.3696 *	.4747 **	.3680 *	.4048 *	.3748 *	.2269 N.S	.4554 *	.4368 *	.4460 *	.0806 N.S
Chemistry Section C				.7332 **	.5812 **	.1404 N.S	.3841 *	.3151 N.S	.5656 **	.7399 **	.5942 **	.6877 **	.7140 **	.5766 **	.2787 N.S	.5249 **	.1208 N.S
Chemistry Section D				.5498 **	.5630 **	.6102 **	.0510 N.S	.3950 *	.4024 *	.6864 **	.4717 *	.5169 **	.3652 N.S	.4821 *	.4700 *	.5656 **	.5108 **
Chemistry Section E				.7534 **	.8917 **	.0200 N.S	.5151 **	.0632 N.S	.0943 N.S	.6589 **	.5101 **	.2666 N.S	.4579 *	.3484 N.S	.2809 N.S	.4320 *	.0458 N.S
Chemistry Section F				.5752 **	.5521 **	.3208 N.S	.2680 N.S	.3151 N.S	.2642 N.S	.6007 **	.5356 **	.4845 **	.3132 N.S	.3223 N.S	.2059 N.S	.1229 N.S	.2504 N.S

TABLE I.

Correlations of Math. and Science Subjects With Other Subjects.

	PHYSICS	BIOLOGY	CHEMISTRY	ALGEBRA	GEOMETRY	QURAN	HADITH	TAUHID	READING	ENGLISH	HISTORY	GEOGRAPHY	GRAMMAR	LITERATURE	BALAGHA	WRITING	FIQH
Algebra Section A					.5477 **	.1386 N.S	.1196 N.S	.1828 N.S	.4085 *	.5301 **	.5684 **	.3812 *	.5636 **	.4272 *	.6811 **	.3418 N.S	.2012 N.S
Algebra Section B					.6841 **	.1643 N.S	.0671 N.S	.3254 N.S	.4826 **	.4273 *	.1847 N.S	.4489 *	.5575 **	.2364 N.S	.3270 N.S	.2972 N.S	.3471 N.S
Algebra Section C					.6348 **	.2064 N.S	.3784 *	.3335 N.S	.4549 *	.6702 **	.7137 **	.6659 **	.5645 **	.6520 **	.3138 N.S	.5533 **	.1543 N.S
Algebra Section D					.5108 **	.5453 **	.1975 N.S	.3904 *	.5145 **	.6202 **	.7188 **	.4455 *	.5853 **	.6147 **	.6779 **	.6060 **	.3647 N.S
Algebra Section E					.7215 **	.1030 N.S	.3372 N.S	.0548 N.S	.0883 N.S	.8093 **	.3555 N.S	.3234 N.S	.3908 *	.4706 *	.4223 *	.2272 N.S	.0548 N.S
Algebra Section F					.4865 **	.1572 N.S	.2718 N.S	.4843 N.S	.3956 *	.3755 *	.5588 **	.5137 **	.5970 **	.5919 **	.2332 N.S	.2567 N.S	.4210 *

TABLE I.

Correlations of Math. and Science Subjects With Other Subjects.

	PHYSICS	BIOLOGY	CHEMISTRY	ALGEBRA	GEOMETRY	QURAN	HADITH	TAUHID	READING	ENGLISH	HISTORY	GEOGRAPHY	GRAMMAR	LITERATURE	BALAGHA	WRITING	FIQH
Geometry Section A						.3582 N.S	.2131 N.S	.1764 N.S	.5112 **	.4722 **	.2653 N.S	.2938 N.S	.6608 **	.5476 **	.5502 **	.2666 N.S	.0000 N.S
Geometry Section B						.3874 *	.2375 N.S	.2787 N.S	.4417 *	.3722 *	.3629 N.S	.4566 *	.2661 N.S	.2773 N.S	.3471 N.S	.3178 N.S	.0300 N.S
Geometry Section C						.0980 N.S	.3032 N.S	.3211 N.S	.2933 N.S	.5791 **	.4931 **	.4580 **	.3351 N.S	.4738 **	.1404 N.S	.4919 **	.0574 N.S
Geometry Section D						.2385 N.S	.2263 N.S	.2742 N.S	.3493 N.S	.4401 *	.3393 N.S	.6800 **	.4120 *	.5020 **	.5763 **	.4231 *	.4554 *
Geometry Section E						.1786 N.S	.2062 N.S	.2587 N.S	.0539 N.S	.5828 **	.4663 *	.3036 N.S	.1947 N.S	.3053 N.S	.5587 **	.3222 N.S	.3118 N.S
Geometry Section F						.1942 N.S	.1908 N.S	.2621 N.S	.2532 N.S	.5434 **	.1876 N.S	.4252 *	.4774 **	.4950 **	.1987 N.S	.1637 N.S	.4838 **

Data presented in Table 1 reveal that student scores in Physics correlated, in most of the cases, with all subjects except subjects of religious studies (Quran, Hadith, Tauhid and Fiqh). The correlations between Physics and Biology were significant at .01 level for all six sections.

Like Physics, Biology also correlated well with all subjects except subjects of religious studies. In addition to being strongly correlated with Physics, Biology scores also correlated at .01 level in five of the six cases with Chemistry and Algebra and in all six cases with Geometry (4 times at .01 level and two times at .05 level).

Students' scores in Chemistry, in addition to being correlated with Physics (all six times) and with Biology (five times), were correlated with Algebra and Geometry all six times. The correlations between scores in Chemistry and all other subjects except religious studies subjects were generally significant.

Algebra scores, in addition to being correlated, significantly with Physics, Biology and Chemistry, correlated with Geometry all six times. With the exception of religious studies subjects, Algebra scores generally correlated significantly with other subjects.

Geometry scores, correlated with Physics five times, with Biology all six times, with Chemistry all six times, and with Algebra all six times. Like Algebra and other science subjects, Geometry scores did not correlate with religious studies subjects scores quite frequently. However, the correlations between Geometry scores and the remaining subjects were generally significant.

It may be pointed out that in addition to frequent significant correlations among scores on scientific and Math. subjects, the scores on the following subjects correlated frequently with science and Math. subjects.

1) English correlated with: Physics six times, Biology five times, Chemistry six times, Algebra six times, and Geometry six times.

2) History correlated with: Physics five times, Biology five times, Chemistry six times, Algebra four times, Geometry two times.

3) Geography correlated with: Physics five times, Biology six times, Chemistry five times, Algebra five times and Geometry four times.

4) Arabic Literature correlated with: Physics five times, Biology four times, Chemistry four times, Algebra five times, and Geometry four times.

5) Balagha correlated with: Physics five times, Biology four times, Chemistry three times, Algebra three times and Geometry three times.

6) Grammar correlated with: Physics four times, Biology five times, Chemistry three times, Algebra six times, Geometry three times.

In addition to the presentation of data concerning the correlations of Math. and science subjects with other subjects, data were also compiled to determine the frequencies with which each subject correlated with others. As pointed out earlier each subject could correlate with other 96 times. Table I: contains these data.

TABLE II.

Number of times correlations among subjects were:

Subjects	Significant at .01 level							Significant at .05 level							Total Significant at .01 & .05 levels	Non-Significant						
	Sections							Sections								Sections						
	A	B	C	D	E	F	TOTAL	A	B	C	D	E	F	TOTAL		A	B	C	D	E	F	TOTAL
1.Physics	10	9	11	11	5	8	54	1	3	0	4	4	2	14	68	5	4	5	1	7	6	28
2.English	12	6	10	11	4	6	49	0	5	1	2	4	7	19	68	4	5	5	3	8	3	28
3.Biology	9	10	12	14	3	8	56	3	3	0	1	4	0	11	67	4	3	4	1	9	8	29
4.Chemistry	11	5	11	9	6	6	48	2	7	1	5	2	1	18	66	3	4	4	2	8	9	30
5.History	9	3	13	9	5	5	44	3	4	1	4	4	6	22	66	4	9	2	3	7	5	30
6.Algebra	8	6	10	12	3	8	47	3	2	2	2	4	4	17	64	5	8	4	2	9	4	32
7.Geography	3	4	9	11	3	7	37	6	6	4	3	2	6	27	64	7	6	3	2	11	3	32
8.Literature	8	4	12	12	1	7	44	4	4	1	2	2	5	18	62	4	8	3	2	13	4	34
9.Balagha	11	4	4	10	8	4	41	1	5	3	3	1	6	19	60	4	7	9	3	7	6	36
10.Grammar	10	2	12	6	3	6	39	2	3	0	4	5	5	19	58	4	11	4	6	8	5	38
11.Reading	4	8	8	9	2	2	33	3	5	3	3	0	5	24	57	4	3	5	4	14	9	39
12.Writing	4	5	11	12	2	3	37	4	3	1	2	5	5	20	57	8	8	4	2	9	8	39
13.Geometry	7	4	9	7	4	7	38	2	4	0	4	2	1	13	51	7	8	7	5	10	8	45
14.Quran	1	1	0	8	0	0	10	2	4	0	4	2	5	17	27	13	11	16	4	14	11	69
15.Tauhid	0	2	1	0	3	3	9	1	3	1	5	4	3	17	26	15	11	14	11	9	10	70
16.Islamic Law	0	1	0	5	0	4	10	0	2	1	6	2	2	13	23	16	13	15	5	14	10	73
17.Hadith	1	0	1	0	2	0	4	0	1	3	0	1	1	6	10	15	15	12	16	13	15	86

Review of Table II shows that Physics and English correlated most often with other subjects (each 68 times). However, Physics correlated with greater frequency at .01 level (54 times) as compared with English (49 times). Biology was next (correlated 67 times) and then were Chemistry and History (each correlated 66 times). Chemistry, however, correlated with greater frequency at .01 level (48 times) then History (44 times). Algebra and Geography each correlated 64 times with other subjects. Algebra correlated with greater frequency at .01 level (47 times) than Geography (37 times). A general look at Table II shows that science and Math. subjects, with the exception of Geometry, were in the top correlates of student performance in other subjects.

Discussion:

Data presented in Tables I and II has shown that Math. and science subjects correlated among themselves with greater frequencies and at higher levels of significance. Also that Math. and science subjects, with the exception of Geometry, correlated with greater frequencies with some subjects compared to many other subjects.

The inter - correlations of Math. and science subjects could be because of overlap in content and concepts for some of the subjects. For example, there would be some overlap between Math. and Physics, between Chemistry and Biology and between Biology and Physics. However, significant and frequent correlations between subjects like Math. and science with subjects like English, History and Literature indicate that variables other than overlap of content and concepts would be playing same part. As indicated previously, the family backgrounds of most of the students were generally the same, i.e, most parents had no education, no formal occupation and families provided almost no help for education of students. Under the circumstances, one can hypothesize that significant and frequent correlations between subjects like Math. and science with subjects like English, History, Literature could be primarily because of student related variables. Even the influence of some of the student related variables can be ruled out. Take the example of student aptitudes and interests. Experience shows that students vary in their interests for various subjects and individual students' interest may vary from one subject to another. However, frequent significant correlations reported above suggest that some common variables are influencing the student scores in various subjects. Since students generally do differ in their

interests and aptitudes for various subjects, therefore, the influence of interests and aptitudes can be ruled out to a great extent. Rather, one can hypothesize that there is greater probability that general intellectual abilities and good study habits are the major variables which might be influencing the students scores across subjects.

Now the question arises why correlations between Math. and science subjects and religious studies subjects were not generally significant? Don't the religious studies subjects need higher intellectual abilities and good study habits?

It may be pointed out that the curriculum in religious study subjects is such that it is only at the college level that higher intellectual abilities of students are challenged to a great extent. At the pre-college level the curriculum in religious study subjects generally emphasizes variables like retention, comprehension, internalization, elicitation of respect, and submission. Further, Saudi society is highly religious. Religious information is transmitted constantly and consistantly through various means of communication. TV, radio, newspaper, magazines, mosques, posters, family festivities and almost in every sphere of one's life, religious information is there. Consequently, performance in religious study subjects is highly influenced by variables other than students' intellectual abilities and student habits. This influence could be responsible for the lack of correlations between religious studies subject and other subjects.

The findings of this study can lend support to the contention that strengthening Math. and science programs in schools, in combination with inculcation of good study habits among students can help develop those intellectual abilities which are instrumental in learning other subjects. Further, the findings of this study can also be used to propose that relative performance of students in Math. and science subjects (specially Physics) is a good indication of their relative performance in most other subjects.